PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Pekka MIELONEN et al

Application No: 09/405,436

Filed: September 23, 1999

For: CYLINDER LOCK-KEY-COMBINATION

Art Unit: 3676

Examiner: Lloyd A. Gall

Reviewed LG 1/23/04

DECLARATION OF REIJO KALEVI HAKKARAINEN

I, Reijo Kalevi Hakkarainen, declare as follows:

1. I hold the degree of Bachelor of Science in Engineering awarded by Wärtsilä Technical Institute of Joensuu, Finland in 1982.

2. I have been engaged in design, research and development regarding lock mechanisms for twenty-one years. I am named as an inventor with respect to two U.S. patents and patent applications and 19 patents and patent applications of other countries. By virtue of my education and experience, I am familiar with the construction and mode of operation of disc cylinder locks and pin tumbler locks, and I am familiar with the experience and level of skill of those who work in the field of design, research and development of locks.

3. I am employed by Abloy Oy, which is assignee of U.S. Patent Application No. 09/405,436 filed September 23, 1999. I have no interest in the outcome of this patent application that is different from that of other employees of Abloy Oy.

4. I am familiar with the disclosure of U.S. Patent Application No. 09/405,436 filed September 23, 1999 and I am also familiar with the disclosure of Rämö et al, U.S. Patent 5,490,405 and Prunbauer et al, Canadian Patent 1 171 680.

5. The operating principle of a lock with rotatable code locking discs (otherwise known as a disc cylinder lock) is quite different from that of a lock that employs pin tumblers. In the case of a disc cylinder lock, the cylinder encloses a set of rotatable locking discs each having a key opening and the key openings together form a key channel. The key opening of each locking disc is bounded by a counter surface, and each locking disc has a peripheral notch. The combination surfaces of the key are inclined to the central longitudinal plane of the key shank. The combination of the key for a disc cylinder lock is specified by the sequence of angular displacements of the combination surfaces relative to the central plane of the key shank. When the key is inserted in the key channel, nothing happens to the locking discs. The lock remains in its locking condition and the cylinder is positively held against rotation relative to the lock body by a locking bar that is located partially in a slot in the cylinder and partially in a recess in the lock body. When the correct key is inserted in the key channel and is turned, the key initially turns relative to the lock cylinder. The combination surfaces of the key cooperate with the counter surfaces of the respective locking discs and cause the discs to turn relative to the lock cylinder to a position in which the peripheral notches of the locking discs are aligned and form a channel for receiving the locking bar. The locking bar is released from the recess in the lock body and upon further turning of the key, the lock cylinder turns with the key relative to the lock body.

In contrast, in a pin tumbler lock, the lock cylinder itself is formed with the key channel for insertion of a key. The combination surfaces of the key are generally perpendicular to the central plane of the key and the combination of the key is specified by the sequence of heights of the combination surfaces relative to the central axis of the key shank. The surfaces between successive combination surfaces are sloped relative to the longitudinal axis of the key shank and serve as cams for displacing the pins to the

proper positions. The key does not turn relative to the lock cylinder. When the proper key is inserted into the lock, the sloping surfaces at the longitudinal edge of the key displace the pins perpendicular to the direction of insertion of the key to positions that are set by the respective combination surfaces. When the proper key is fully inserted into the key channel, the pins are positioned so that the cylinder is released and can be turned relative to the lock housing without any further movement of the key relative to the cylinder. Turning of the cylinder operates the bolt.

6. The key that is shown in FIG. 2b of U.S. Patent Application No. 09/405,536 may be inserted in the lock in two different positions that differ by 180°. See page 11, lines 2-5. Consequently, the key has rotational symmetry of order 2 and since the key is made by cutting the key blank shown in FIG. 2a to provide combination surfaces corresponding to each locking disc, the key blank also has rotational symmetry of order 2.

7. Rämö et al discloses a disc cylinder lock. FIG. 5 of Rämö et al shows a key 12 for operating the disc cylinder lock and also illustrates the cross-sectional form of the key blank, prior to cutting of combination surfaces 27. The key blank of Rämö et al has rotational symmetry of order 2, i.e. upon turning the blank through 180° about its longitudinal axis from the angular position shown in FIG. 5, the blank reaches a second angular position in which the cross-sectional form of the blank is indistinguishable from that shown in FIG. 5. The key blank has two active surfaces 33 (upper right and lower left), each of which is cut, at a given locking disc position, with the same combination value in order to preserve the rotational symmetry. Thus, the key can be inserted in the key channel in either of two equivalent orientations at 180° from each other. Since the key has only two active surfaces, the lock has only a single direction for operation; in the case of

the key shown in FIG. 5, the key is turned clockwise for releasing the lock. The key blank of Rämö et al is not substantially symmetrical with respect to a plane containing the longitudinal axis of the shank.

8. In Prunbauer et al, most of the tumblers are implemented as balls rather than elongated pins but this does not affect the principle of operation of the lock. FIGS. 11-14 of Prunbauer et al show the cross-sectional form of the key at the locations C, B, A and D, respectively, in FIGS. 9 and 10. It will thus be seen that FIGS. 12 and 13 do not illustrate the cross-sectional configuration of a key blank, which is substantially uniform over the length of the key shank, but cross-sectional configurations of a completed key at different tumbler locations. In my opinion, there is no doubt that a person skilled in the art of design, research and development of locks would recognize that the key shown in FIGS. 9-14 of Prunbauer et al is not suitable for use in a disc cylinder lock. I do not believe that it is possible to draw any reliable inferences from Prunbauer et al regarding the cross-sectional form of the blank used to make the key shown in FIGS. 9-14 of Prunbauer et al, but it is likely that the cross-sectional form of the blank would correspond to the section shown in FIG. 11, except for the recess 132. A key blank having the cross-sectional form shown in FIG. 11 of Prunbauer et al, except for the recess 132, would not have rotational symmetry of order 2.

9. It appears that the reference numeral 133 in FIG. 12 of Prunbauer et al should in fact be 130 (see FIG. 9 and the description of FIGS. 9 and 10 on page 13 of the specification). The surface between the surfaces 126 and 133 (129) of the key shown in FIGS. 9-14 of Prunbauer et al is not an axially facing step but is a cam surface for displacing the tumblers during insertion and removal of the key and for accurately positioning the tumbler longitudinally. The

surface 126 is not a combination or cut surface of the key but is a segment of a bevel surface that remains after the combination surfaces have been cut.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, Sec. 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signature

August 6 2003
Date